

### CLAIMS

What is claimed is:

1. A method comprising:  
transmitting a pulse signal over a transmission channel between a transmitting station and a communication receiving station; and  
repeating the transmitting of the pulse signal over the transmission channel between the transmitting station and the communication receiving station until a delay/amplitude map of the transmission channel is received from the communication receiving station.
2. The method of claim 1, further comprising:  
pre-distorting signal transmissions over the transmission channel between the transmitting station and the communication receiving station in order to eliminate channel echoes in a received data signal.
3. The method of claim 2, wherein the pre-distorting further comprises:  
determining a time delay and amplitude for each echo indicated by the received delay/amplitude map;  
generating a synthetic anti-echo for each echo indicated by the received delay/amplitude map, each respective synthetic anti-echo having an equal time delay and an inverse amplitude of a respective echo;  
recursively generating recursive anti-echoes for echoes caused by synthetic anti-echoes until a residual echo spectrum of the transmission channel is below a predetermined threshold; and  
when transmitting a data signal over the transmission channel, combining the synthetic anti-echoes and the recursive anti-echoes with the transmitted data signal, thereby eliminating channel echoes in the received data signal.
4. The method of claim 1, further comprising:  
receiving a pulse signal from a communication transmitting station over a reverse transmission channel between a receiving station and the communication transmitting station;  
driving a delay line including one or more taps with the received pulse signal;  
sampling each of the one or more taps of the delay line to determine a time delay and amplitude of each echo in the received pulse signal; and  
repeating the receiving, driving and sampling for each received pulse signal from the communication transmitting station until a delay/amplitude echo map of the reverse transmission channel between the communication transmitting station and the receiving station is complete.

5. The method of claim 4, further comprising:  
transmitting the delay/amplitude map of the reverse transmission channel to the communication transmitting station.
6. The method of claim 4, further comprising:  
removing channel echoes from input transmission signals received by the receiving station using an echo structure of the delay/amplitude echo map of the reverse transmission channel between the receiving station and the communication transmitting station.
7. The method of claim 6, wherein the removing channel echoes from input transmission signals further comprises:  
determining a time delay and amplitude for each echo indicated by the echo structure of the delay/amplitude echo map;  
generating a synthetic anti-echo for each echo indicated by the received delay/amplitude map, each respective synthetic anti-echo having an equal time delay and an inverse amplitude of each respective echo; and  
when receiving a data signal over the reverse transmission channel, combining the synthetic anti-echoes with the received data signal, thereby eliminating channel echoes in the received data signal.
8. A computer readable storage medium including program instructions that direct a computer to function in a specified manner when executed by a processor, the program instructions comprising:  
transmitting a pulse signal over a transmission channel between a transmitting station and a communication receiving station; and  
repeating the transmitting of the pulse signal over the transmission channel between the transmitting station and the communication receiving station until a delay/amplitude map of the transmission channel is received from the communication receiving station.
9. The computer readable storage medium of claim 8, further comprising:  
pre-distorting signal transmissions over the transmission channel between the transmitting station and the communication receiving station in order to eliminate channel echoes in a received data signal.
10. The computer readable storage medium of claim 8, wherein the pre-distorting further comprises:  
determining a time delay and amplitude for each echo indicated by the received delay/amplitude map;

generating a synthetic anti-echo for each echo indicated by the received delay/amplitude map, each respective synthetic anti-echo having an equal time delay and an inverse amplitude of a respective echo;

recursively generating recursive anti-echoes for echoes caused by synthetic anti-echoes until a residual echo spectrum of the transmission channel is below a predetermined threshold; and

when transmitting a data signal over the transmission channel, combining the synthetic anti-echoes and the recursive anti-echoes with the transmitted data signal, thereby eliminating channel echoes in the received data signal.

11. The computer readable storage medium of claim 8, further comprising:  
receiving a pulse signal from a communication transmitting station over a reverse transmission channel between a receiving station and the communication transmitting station;

driving a delay line including one or more taps with the received pulse signal;

sampling each of the one or more taps of the delay line to determine a time delay and amplitude of each echo in the received pulse signal; and

repeating the receiving, driving and sampling for each received pulse signal from the communication transmitting station until a delay/amplitude echo map of the reverse transmission channel between the communication transmitting station and the receiving station is complete.

12. The computer readable storage medium of claim 11, further comprising:  
transmitting the delay/amplitude map of the reverse transmission channel to the communication transmitting station.

13. The computer readable storage medium of claim 11, further comprising:  
removing channel echoes from input transmission signals received by the receiving station using an echo structure of the delay/amplitude echo map of the reverse transmission channel between the receiving station and the communication transmitting station.

14. The computer readable storage medium of claim 13, wherein the removing channel echoes from input transmission signals further comprises:

determining a time delay and amplitude for each echo indicated by the echo structure of the delay/amplitude echo map;

generating a synthetic anti-echo for each echo indicated by the received delay/amplitude map, each respective synthetic anti-echo having an equal time delay and an inverse amplitude of each respective echo; and

when receiving a data signal over the reverse transmission channel, combining the synthetic anti-echoes with the received data signal, thereby eliminating channel echoes in the received data signal.

15. An apparatus comprising:

a communication interface to transmit a pulse signal over a transmission channel to a communication receiving station and to repeat the transmission of the pulse signal over the transmission channel until a delay/amplitude map of the transmission channel is received from the communication receiving station.

16. The apparatus of claim 15, wherein the communications interface is to receive a delay/amplitude echo map of the transmission channel from the communication receiving station.

17. The apparatus of claim 15, wherein the communications interface is to remove channel echoes from received signals by using an echo structure of a received delay/amplitude echo map of the transmission channel.

18. The apparatus of claim 15, wherein the communications interface is to pre-distort signal transmissions over the transmission channel to eliminate channel echoes in transmitted data signals.

19. The apparatus of claim 15, further comprising:

a delay line coupled to the communications interface, the delay line including a plurality of non-uniformly spaced taps, the non-uniform taps to enable sampling of varying delay echoes.

20. A system comprising:

a plurality of communication stations coupled to form a wireless network,  
each communication station comprising:

a communications interface to repeat the transmission of the pulse signal over the transmission channel until a delay/amplitude map of the transmission channel is received from the communication receiving station.

21. The system of claim 20, wherein each communication station further comprises:

a back channel to transmit a delay/amplitude echo map of a transmission channel to a communication transmission station.

22. The system of claim 20, wherein the communications interface is to receive a delay/amplitude echo map of the transmission channel from a communication receiving station.

23. The system of claim 20, wherein the communications interface is to remove channel echoes from received signals by using an echo structure of a received delay/amplitude echo map of the transmission channel.

24. The system of claim 20, wherein the communications interface is to pre-distort signal transmissions over the transmission channel to eliminate channel echoes in transmitted data signals.

25. The system of claim 20, further comprising:  
a delay line coupled to the communications interface, the delay line including a plurality of non-uniformly spaced taps, the non-uniform taps to enable sampling of varying delay echoes.